

Bushmills & Portballintrae WwT Project

£7m wastewater upgrade project on schedule to deliver higher quality bathing water in popular tourist region

by
Kieran Grant

Commencing on site in May 2009, the Bushmills & Portballintrae Wastewater Treatment Project represents an investment by Northern Ireland Water (NI Water) of £7m, to rationalise and upgrade the existing sewerage treatment systems to raise the standard of discharge in line with the latest European standards and bring about higher quality bathing and fishing waters in an area that welcomes thousands of tourists every year.



Aerial showing Portballintrae and Bushmills (to the rear of photograph)

Courtesy of Northern Ireland Water

Background and need for the scheme

The villages of Bushmills and Portballintrae are situated approximately one mile apart on the north Antrim coast, within an Area of Outstanding Natural Beauty and close to a World Heritage Site and National Nature Reserve, lying adjacent to the famous Giant's Causeway.

The area is rich in cultural heritage and with its many unique attractions, such as the Giant's Causeway and The Old Bushmills Distillery, is a popular location for tourists. Flanked by beautiful sandy beaches, the area has become a popular 'getaway' location for Northern Ireland homeowners and as a result, residential development has increased significantly over recent years, mounting pressure on the existing wastewater infrastructure.

Bushmills Wastewater Treatment Works, which sits on the banks of the River Bush on the edge of a large conservation area, dates back to the 1940s. Significant improvement work was carried out during the late '70s with the works upsized to treat a population equivalent (PE) of 2,000. Whilst the structures remained reasonably sound, the

mechanical and electrical equipment had become outdated in recent years, leaving the plant both biologically and hydraulically under sized process wise and struggling to meet the Registered Discharge Standards set by the Northern Ireland Environment Agency (NIEA).

Somewhat newer in construction, Portballintrae WwTW was built in the 1970s to serve the small village population but had not benefited from any upgrades since. Wastewater and storm water are collected at the site and settled effluent is discharged to sea through a short sea outfall pipe. The site is on the NIEA Public Register for wastewater treatment works and although it has a consent to discharge until Dec 2010, it will not comply with future NIEA standards for coastal discharges. In addition, the beaches in the area represent a significant tourist amenity (with potential to gain Blue Flag status) and NIEA will set discharge standards accordingly.

To address this situation NI Water is undertaking a major programme of improvement work across the Bushmills/Portballintrae wastewater treatment network and wider catchment areas.



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Aerial photo of Bushmills WwTW June 2010

Courtesy of Northern Ireland Water

Project appraisal

In 2004 NI Water undertook a 'Flow and Load' appraisal to determine domestic and industrial loading to the year 2035, taking into consideration the catchments of Bushmills (including the Bushmills Distillery 16,000PE), Portballintrae, Causeway and Aird. Also accounted for in the appraisal was the 1,200PE expected from the proposed Runkerry hotel and leisure development, resulting in a total maximum PE of over 25,000.

Concurrently, a Drainage Area Study of the network was undertaken to establish the strengths and weaknesses of the existing infrastructure and recommend upgrades, in agreement with NIEA, to reduce spills, flooding and pollution incidents within the network.

Following an economic assessment, the long-established Bushmills Distillery opted to install its own treatment processes and outfall, meaning that the design for the new Bushmills WwTW did not need to account for this extensive industrial load. With the Bushmills Distillery not included, the forecasted PE for the year 2035 was vastly reduced to around 8,800PE.

The business case for the scheme assessed 17 options for the rationalisation of the four catchment areas and recommended a new wastewater works be constructed on the site of the existing Bushmills WwTW.

A restricted list of competent tenderers was drawn up and a preferred bidder appointed late 2008. A three-month design development phase ensued, after which the scheme was awarded in March 2009 under the NEC3 Option A Conditions of Contract to

Joint Venture contractors, GEDA Construction and Ovivo (formerly Eimco Water Technologies). McAdam Design was appointed to the team as Engineering, Architectural and Landscape Consultants.

What the scheme entails

Included in the scheme is a new conventional ASP wastewater treatment works on the site of the existing works in Bushmills. With built-in flexibility, the new works has been designed to the year 2035 to treat flows of varying volumes, due to the fluctuations in PE brought about by the seasonal tourism business in the area. In summer the works will be able to treat up to 8,860 PE and in winter it will downtime capably to treat a lower PE of up to 5,725.

In addition to the modern new wastewater treatment works, the multi-million pound project involves the refurbishment of Seaport Avenue Pumping Station and the Caravan Park Pumping Station in Portballintrae, as well as the existing retention tanks on the Portballintrae WwTW site. These revamped tanks will be used to hold storm water during prolonged periods of heavy rainfall. Storm water collected will be fully screened and may be discharged to sea through a new 450mm diameter pipeline to the existing outfall to meet NIEA compliance requirements i.e. three spills per bathing season from the existing sea outfall and two per 10 years from the Caravan Park PS overflow (which discharges to a stream that flows across the beach into the bay).

The scheme has been carefully designed to allow for the phased demolition of the existing wastewater treatment structures at Bushmills whilst new facilities are being constructed on the same site. This has ensured that the site has remained operational throughout the contract period.



Some of the structures in the old Bushmills works which date back to the 1970s

Courtesy of
Northern Ireland Water



View showing the new screw pumps on right and old screws on left before they were demolished

Courtesy of
Northern Ireland Water



Bushmills WwTW - MMC building
and aeration lanes May 2010

Courtesy of Northern Ireland Water

Once the entire modern new infrastructure is in place and the necessary upgrades made, two CSOs in the Bushmills network will be closed; the old Bushmills WwTW will be fully decommissioned and demolished; and wastewater treatment at Portballintrae will cease operation.

These changes to the existing arrangements will mean that from December 2010 all wastewater from Portballintrae will be transferred to the new works at Bushmills for advanced treatment. To facilitate this, a new 1.8km long, 250mm diameter pumping main has been laid to link Portballintrae to the new Bushmills site.

To enable further rationalisation and improvements to the wider sewerage network, the new works at Bushmills has also been designed to treat flows from the nearby Giant's Causeway and Aird regions, allowing existing outdated wastewater works at these sites to be decommissioned in the future; as well as the expected 1200PE from the Runkerry hotel and leisure development when it is built.

Process description

At the new Bushmills WwTW, all sewage flows will enter a new reception chamber and inlet screw pumping station sump. The screw lifting pumping station comprises 3 No. screws operating as 2 No. duty and 1 No. standby, capable of lifting 162l/s (Formula A Summer 2035). A new CSO overflow facility, with a mechanically raked 6mm bi-directional storm water screen, will screen flows before discharging storm water into the River Bush.

The new preliminary treatment plant comprises duty/standby 6mm bi-directional screens, each with screening conditioning facilities and a 'packaged' grit and grease removal unit capable of handling flows up to Formula 'A' flow (162 l/s).

Flows in excess of the combined Summer 2035 Flow to Full Treatment (FFT) (52l/s) will overflow to new storm tanks. FFT will pass forward to primary treatment, regulated by an automatic control mechanism. pH monitoring of the raw sewage will be provided and flows will be automatically diverted to the storm tanks in the event of high or low pH being detected.

Two new primary settlement tanks (10m dia with 2.5m high walls) have been incorporated into the design, which will be capable of hydraulically handling flows up to FFT plus a 5% allowance for return sludge liquors.

The settled sewage from the primary settlement tanks will flow into a new conventional activated sludge plant, comprising an anoxic selector tank and four aeration lanes. The aeration lanes, in conjunction with the final settlement tanks, will be capable of operating at elevated mixed liquor concentrations when one lane is out of service indefinitely without compromising the effluent consent standard.

Mixed liquor from the aeration tanks will flow to a new flow distribution chamber to the 2 No. final settlement tanks (each 15.2m dia with 3.0m high walls) by means of weirs. Sludge blanket detectors will be provided for each final settlement tank for alarm purposes.

Sympathetic design & construction

NI Water appreciates the high amenity value and scenic importance of the area surrounding the new Bushmills Wastewater Treatment Works and has worked closely with planners, architects, engineers and landscape experts to develop visually-pleasing low-impact designs that will blend effortlessly with the natural character of the landscape.

The new wastewater treatment facility is being constructed entirely within the confines of the existing site perimeter. The buildings are in forms which echo traditional agricultural buildings, with curved roofs, aluminium cladding and natural stone gables.

To promote sustainability, trenchless methods of pipe laying have been utilised where possible and all spoil excavated on the Bushmills site will be reused in landscaping the area around the new works.



Inside the inlet building May 2010

Courtesy of Northern Ireland Water



(Left) View of site across the River Bush before any river bank improvements and (right) strengthening the banks of the River Bush Courtesy of Northern Ireland Water



Rainwater will be harvested and used, along with final effluent, in the operational phase of the plant, as washwater during the treatment process.

Challenges

Apart from the need to design and construct a wastewater treatment works that would be accepted in a high value amenity area, the biggest challenge for the team has probably been to construct a modern new works whilst maintaining operations at the existing plant on the same site and accommodating seasonal fluctuations in flow and load.

All construction is being carried out in phases with sections of the new plant being built and commissioned sequentially to allow portions of the existing plant to be taken off line.

During construction, no relaxation in discharge consent standards has been permitted and therefore it has been imperative to maintain high quality standards to the River Bush for final effluent and construction ground water.

Landscaping

Landscaping will be carried out in the earliest possible planting season (2010/11) after the new works has been constructed. The main objectives are to screen the new wastewater treatment compound with a belt of native trees and shrubs, mainly deciduous species suited to the waterside location but including evergreen, and create a natural habitat for wild birds and mammals. The planting mix has been designed to require minimum management with oak and pine as the likely "climax" species and a dense understory of native shrub species.

River protection and improvements

NI Water, in partnership with the GEDA/Ovivo (formerly Eimco) JV, have developed a robust Environmental Management Plan to meet NIEA requirements for the contract which means that all possible measures have been undertaken to ensure that the construction work does not adversely impact on the adjacent River Bush and/or other watercourses.

As an added benefit, NI Water and their contracting partners are working closely with the Department of Culture, Arts and Leisure and other stakeholders to implement a series of improvements along the riverside as part of this scheme. Already the team has strengthened the entire length of river bank running alongside the site boundary and has plans to construct 'accessible for all' paths and fishing platforms, along with disabled car parking, to further enhance the adjoining fishing area.

Furthermore, in a bid to promote biodiversity, otter holts, bird boxes and bat boxes will be installed along the river and native wild flowers and grasses will be established to encourage insect life. The team also has plans to erect an owl box on the gable of a building on the site.

Considerate programming

The programme of works for the Bushmills & Portballintrae Wastewater Treatment Scheme has been carefully planned to minimise disruption during holiday periods and as a result no pipe laying work has been undertaken on roads during the busy tourist seasons.

With all pipelines now installed and all upgrades completed in Portballintrae, the focus is on finishing installations at the new Bushmills works. With everything running to programme, GEDA/Ovivo (formerly Eimco) JV are set to start commissioning the entire new infrastructure in October 2010.

Note: *The Editor & Publishers thank Kieran Grant, Senior Project Manager with Northern Ireland Water, for preparing the above article for publication.■*



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Bushmills Wastewater Treatment Works

N Ireland



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